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**Respiratory muscle training for aerobic endurance performance at 3,658m altitude.**

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Increased ventilation is one effect of altitude hypoxia. This increases the work and energy cost of ventilation. Therefore, during sustained aerobic exercise this may lead to respiratory muscle fatigue and secondary locomotor muscle fatigue. **PURPOSE:** Determine if resistive or endurance respiratory muscle training (RRMT and ERMT, respectively) vs. sham RMT (SRMT) improves exercise performance during acute exposure at 3,658 m. We hypothesize that ERMT would augment time to exhaustion more than RRMT and SRMT. **METHODS:** Twenty four subjects (age: 24±3 y; body fat: 16±6 %; $\dot{V}O_{2max}$: 38±6 mL·kg·min-1) cycled to exhaustion (55% $\dot{V}O_{2max}$) in a hypobaric chamber at a 3,658 m before and after four weeks of respiratory muscle training (RMT). Prior to training, subjects completed a $\dot{V}O_{2max}$, pulmonary function, and respiratory endurance tests (RET). Subjects were randomly assigned to SRMT (n=8), RRMT (n=8), or ERMT (n=8). All RMT consisted of three, 30-min training sessions per week for four weeks. The SRMT group completed a 5-sec inspiration, 5-sec breath hold, and 5-sec expiration every 30-sec. The RRMT group completed a maximal inspiration and expiration against 60% of maximal inspiratory ($P_{Imax}$) and expiratory pressure ($P_{Emax}$) every 30-sec. The ERMT breathed into bag that maintained isocapnia continuously for 30 min (bag volume=55% vital capacity; breath frequency=0.60*maximal voluntary ventilation/bag volume). **RESULTS:** There were no differences in pre-RMT anthropometrics, pulmonary function, $\dot{V}O_{2max}$, or cycle time to exhaustion between groups (all p>0.05). There were no changes in forced vital capacity after RMT (p=0.85). The RRMT group increased $P_{Imax}$ and $P_{Emax}$ after RMT (p=0.009 and p=0.04, respectively). The ERMT group increased RET after RMT (p=0.04). There was no difference in $\dot{V}O_{2max}$ after RMT in any group. There was no difference in cycle time to exhaustion after RMT (p=0.14) or between groups (p=0.4) **CONCLUSION:** Despite selectively improving pulmonary function, four weeks of RRMT and ERMT did not improve cycle time to exhaustion at 3,658 m simulated altitude.

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